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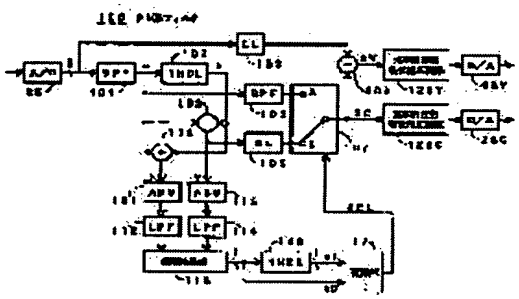
(54) COMB LINE FILTER AND VIDEO DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an adaptive comb line filter whose circuit size is small and whose structure is also simple.
SOLUTION: A 1st delay circuit 102 performs one horizontal period delay of a carrier color signal that is extracted from a composite color video signal by a band pass filter 101. A 1st subtractor 103 acquires a subtraction output between an output signal of the filter 101 and an output signal of the circuit 102, and an adding circuit 104 acquires an addition output between them. A correlation detecting circuit 115 which outputs a binary signala k0 based on the relation between the outputs of the circuits 103 and 104 is provided, and the signal k0 and a signal k1 which is undergone one horizontal period delay of the signal k0 through a 2nd delay circuit 116 are supplied to an operating part 117. The part 117 outputs a selection signal which switches and controls outputs of the filter 101 or further, a band pass filter 105 that eliminates a luminance signal component and an output of the circuit 103, from an operation result of the signals k0 and k1, and a carrier color signal is acquired from a switching circuit 107.



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CLAIMS

[Claim(s)]
[Claim 1] The band pass filter which extracts and outputs the frequency band component of a carrier chrominance signal from this composite color video signal in response to a composite color video signal, The 1st delay circuit which carries out 1 level period delay of the output of this band pass filter in response to the output of said band pass filter, The 1st subtractor circuit which obtains the subtraction output of the output signal of said band pass filter, and the output signal of said 1st delay circuit, The adder circuit which obtains the addition output of the output signal of said band pass filter, and the output signal of said 1st delay circuit, The change-over circuit which switches and outputs the output of said band pass filter, and the output of said 1st subtractor circuit, The correlation detector which outputs the binary signal which undergoes the output of said 1st subtractor circuit, and the output of said adder circuit, and shows the existence of correlation with the output signal of said band pass filter, and the output signal of said 1st delay circuit based on the relation of both outputs, The 2nd delay circuit which carries out 1 level period delay of said binary signal from said correlation detector,

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to visual equipments carrying the Cush form filter which separates and outputs a luminance signal and a carrier chrominance signal from a composite color video signal, and this Cush form filter, such as for example, a color-television receiving set and VTR.
[0002]
[Description of the Prior Art] For example, in a television receiver, in order to obtain the output image by the received composite color video signal, it is necessary to separate a luminance signal and a carrier chrominance signal. Moreover, with VTR, an input composite color video signal is divided into a luminance signal and a carrier chrominance signal, a luminance signal carries out FM modulation, frequency conversion of the carrier chrominance signal is carried out, and it is recorded on the low-pass side of FM luminance signal.
[0003] The Cush form filter which used that the functionality of the perpendicular direction of the screen of a color video signal and the phase of a chrominance subcarrier were reversed for every 1 level period as an approach of separating a luminance signal and a carrier chrominance signal from a composite color video signal as mentioned above is often used recently. This is because there is an advantage which can avoid generating of this cross color, when the luminance signal and the carrier chrominance signal were separated using band-pass filters, such as a band pass filter, and the Cush form filter is used to degradation of the image with which the high-frequency component of the luminance signal included in the band of a carrier chrominance signal mixes in a carrier chrominance signal, and is called a cross color occurring.
[0004] Drawing 8 shows the fundamental circuitry of this Cush form filter.
[0005] That is, the luminance signal Y inputted from an input terminal 11 and the composite color video signal Sa including a carrier chrominance signal C are supplied to the delay circuit 12 of 1 level period, and after 1 level period delay is carried out, they are supplied to the 1st subtractor circuit 13. The composite color video signal Sa from an input terminal 11 is directly supplied to the 1st subtractor circuit 13 again.
[0006] If a subtraction operation is performed in this subtractor circuit 13, since a luminance-signal component has the almost the same signal of the ****** level section, the luminance-signal component concerned will be negated from the perpendicular functionality of a video signal. On the other hand, since the phase of a chrominance subcarrier is reversed for every 1 level period, in a subtractor circuit 13, it becomes in phase [the chrominance-subcarrier component of the adjacent level section], and, for this reason, only a carrier chrominance signal component is obtained from a subtractor circuit 13. And the band pass filter 14 which makes a passband 3.58MHz**500kHz (in the case of an NTSC signal) is supplied, a carrier chrominance signal C is taken out from this band pass filter 14, and the carrier chrominance signal component from this subtractor circuit 13 is drawn by output terminal 17C.
[0007] On the other hand, the composite color video signal Sa inputted through the input terminal 11 is supplied to the 2nd subtractor circuit 16 through a delay circuit 15. A delay circuit 15 is a thing for timing doubling with the carrier chrominance signal C outputted from a band pass filter 14, and is delayed in the sum of delay of 1 level period by the 1st delay circuit 12, and delay with a subtractor

circuit 13 and a band pass filter 14.
[0008] And the carrier chrominance signal C acquired from a band pass filter 14 is supplied to the 2nd subtractor circuit 16, and it subtracts from a composite color video signal. Therefore, a luminance signal Y is acquired and it is drawn from the 2nd subtractor circuit 16 by output terminal 17Y. According to the Cush form filter as mentioned above, generating of a cross color can be avoided and a luminance signal Y and a carrier chrominance signal C can be separated from a composite color video signal.
[0009] However, since there is no perpendicular functionality of a carrier chrominance signal in the scanning line which the phase of a carrier chrominance signal reversed when a composite color video signal which changes to the horizontal scanning line of the contents of a signal which the phase of a carrier chrominance signal reversed is inputted into the above-mentioned Cush form filter, for example from the horizontal scanning line which is the flat contents of a screen uniformly, it cannot dissociate completely and a carrier chrominance signal cannot be taken out from a composite color video signal. For this reason, a carrier chrominance signal component remains to the luminance signal Y of output terminal 17Y in this scanning line, and the so-called dot active jamming occurs in it.
[0010] Moreover, in the carrier chrominance signal C drawn by output terminal 17C, the signal level in the scanning line concerned fell, and there was also a problem on which the vertical definition of a carrier chrominance signal deteriorates.
[0011] To this problem, these people supervised the adjacent perpendicular functionality for three lines, and, so to speak, the Cush form filter of an ecad is proposed between Rhine with perpendicular functionality using the luminance signal and carrier chrominance signal output which were separated with the Cush form filter having used the luminance signal and carrier chrominance signal output which were separated with the band pass filter at the time of Rhine without perpendicular functionality (for example, reference, such as JP,3-70383,A).
[0012] According to this, generating of dot active jamming is avoidable by making into an output signal the luminance signal and carrier chrominance signal which were separated with the band pass filter in the scanning line without perpendicular functionality about the carrier chrominance signal.
[0013]
[Problem(s) to be Solved by the Invention] By the way, since it is necessary to supervise perpendicular functionality of the video signal between 3 horizontal-scanning lines in the case of an above-mentioned ecad Cush form filter, The signal which carried out 1 level period delay to the present input signal using two delay circuits delayed in 1 level period about the composite color video signal as shown in said official report etc., He generates the signal which carried out 2 level period delay, and is trying to supervise the perpendicular functionality between the perpendicular functionality between the signals which carried out 1 level period delay with the present input signal and the signal which carried out 1 level period delay, and the signal which carried out 2 level period delay, respectively.
[0014] Thus, in the configuration of the conventional ecad Cush form filter, since the delay circuit of two 1 level periods for which a composite color video signal is delayed was needed, there was a problem that a circuit scale will become large, comparatively. Moreover, since it was the configuration separately equipped with the circuit which supervises the perpendicular functionality between the circuit which supervises the perpendicular functionality between the signals which carried out 1 level period delay with the present input signal, the signal which carried out 1 level period delay, and the signal which carried out 2 level period delay, respectively, circuitry was complicated.
[0015] In view of the above point, this invention has a small circuit scale compared with the former, and aims at offering the ecad Cush form filter which can also simplify a configuration.
[0016]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the Cush form filter by this invention The 1st delay circuit which carries out 1 level period delay of this composite color video signal in response to a composite color video signal including a luminance signal and a carrier chrominance signal, The band pass filter which extracts and outputs said carrier chrominance signal component from this composite color video signal in response to said composite

color video signal, The 1st subtractor circuit which obtains the subtraction output of the output signal of said band pass filter, and the output signal of said 1st delay circuit, The adder circuit which obtains the subtraction output of the output signal of said band pass filter, and the output signal of said 1st delay circuit, The change-over circuit which switches and outputs the output of said band pass filter, and the output of said 1st subtractor circuit, The correlation detector which outputs the binary signal which undergoes the output of said 1st subtractor circuit, and the output of said adder circuit, and shows the existence of correlation with the output signal of said band pass filter, and the output signal of said 1st delay circuit based on the relation of both outputs, The 2nd delay circuit which carries out 1 level period delay of said binary signal from said correlation detector, Said binary signal from said correlation detector and the signal from said 2nd delay circuit are received, and it has the arithmetic circuit which outputs the selection signal which switches and controls said change-over circuit from the result of an operation of both signals, and is characterized by acquiring a carrier chrominance signal from said change-over circuit.

[0017] In the Cush form filter by this invention of the above-mentioned configuration, the frequency band component of a carrier chrominance signal is extracted from a composite color video signal by the band pass filter, the output signal of this band pass filter is supplied to the 1st delay circuit, and 1 level period delay is carried out. And the signal of the I/O edge of this 1st delay circuit is subtracted in the 1st subtractor circuit, and a carrier chrominance signal is taken out from this 1st subtractor circuit.

[0018] And while the output signal of this 1st subtractor circuit is supplied to a correlation detector, the signal of the I/O edge of the 1st delay circuit is supplied to an adder circuit, and the output signal of this adder circuit is supplied to a correlation detector.

[0019] When perpendicular functionality is in a carrier chrominance signal, as an output signal of the 1st subtractor circuit, the carrier chrominance signal concerned is acquired on comparatively big level, and, on the other hand, the output of the small level against which the carrier chrominance signal of 2 level period was set off is obtained as an output signal of an adder circuit.

[0020] On the contrary, there is no perpendicular functionality in a carrier chrominance signal, for example, when a phase is opposition, the output signal of the 1st subtractor circuit serves as small level, and, on the other hand, the output signal of an adder circuit becomes large.

[0021] In a correlation detector, based on the above-mentioned relation of the output of the 1st above-mentioned subtractor circuit, and the output of an adder circuit, the existence of the perpendicular functionality of the carrier chrominance signal between 2 horizontal-scanning lines is detected, and the binary signal of the detection output is outputted.

[0022] The binary signal as a detection output of the existence of this perpendicular functionality is supplied to an arithmetic circuit through the 2nd delay circuit while it is supplied to an arithmetic circuit as it is. An arithmetic circuit acquires the information on the perpendicular functionality between 3 horizontal-scanning lines from the binary signal of I/O of this 2nd delay circuit. And based on the relation of the existence of the perpendicular functionality between this 3 horizontal-scanning line, an arithmetic circuit performs change-over control of the change-over circuit which switches and outputs the output of a band pass filter, and the output of the 1st subtractor circuit.

[0023] What is necessary is just to prepare one of the 1st delay circuit as an object for delay of the signal of a carrier chrominance signal band in this above-mentioned invention. And since the 2nd delay circuit delayed in the output of a correlation detector should just be delayed in a binary signal, the thing of an easy configuration can be used for it. Moreover, a correlation detector can be managed with one about a part for the signal of 2 horizontal scanning lines of I/O of the 1st delay circuit.

[0024]

[Embodiment of the Invention] Hereafter, the Cush form filter by this invention is explained with reference to drawing about the gestalt of operation at the time of applying to a color-television receiving set.

[0025] First, the outline of the configuration of a color-television receiving set in which the Cush form filter of the gestalt of this operation is applied is shown in drawing 3 .

[0026] That is, the television broadcasting signal received with TV antenna 21 is supplied to a tuner 22, and the broadcast signal of the channel according to channel selection actuation of a user is

changed into an image intermediate frequency signal. The image intermediate frequency signal from this tuner 22 is supplied to a video detector 24 through a video IF amplifier 23, and a composite color video signal restores to it.
[0027] In this example, after this composite color video signal is changed into a digital signal by A/D converter 25, it is supplied to the ecad Cush form filter 100 with which the Cush form filter of the gestalt of this operation mentioned later is applied, and is divided into the luminance signal DY and carrier chrominance signal DC of a condition of a digital signal. The digital outputs DY and DC of this Cush form filter 100 are supplied to D/A converters 26Y and 26C, respectively, and are returned to the luminance signal Y and carrier chrominance signal C of an analog signal.
[0028] And a luminance signal Y is supplied to the matrix circuit 28 as it is. Moreover, a carrier chrominance signal C is supplied to the chroma decoder 27, and color-difference-signal R-Y and B-Y are decoded. And these color-difference-signals R-Y and B-Y are supplied to the matrix circuit 28.

[0029] The matrix circuit 28 generates the three-primary-colors signals R, G, and B from the luminance signal Y inputted into this, color-difference-signal R-Y, and B-Y, supplies these signals R, G, and B to the color cathode-ray tube 29, and reproduces an image on the screen.
[0030] Next, the Cush form filter of the gestalt of this operation is explained with reference to drawing 1 and drawing 2 . Drawing 1 shows the circuitry of the Cush form filter of the gestalt of this operation, and drawing 2 is a timing diagram for explaining circuit actuation of this Cush form filter.

[0031] Although a composite color video signal is digitized in A/D converter 25 as mentioned above, in the case of this example, sampling frequencies are 4fs(es) (fs is a chrominance-subcarrier frequency and, in the case of NTSC system, is about 3.58MHz), and a composite color video signal is made into the digital signal of 8 bits / 1 sample. This digital composite color video signal is supplied to a band pass filter 101, and the component of the frequency band of a carrier chrominance signal is extracted now.
[0032] The output of a band pass filter 101 is supplied to the 1st delay circuit 102, and 1 level period delay is carried out. In this example, a digital video signal serves as about 910 samples per 1 level period, and since digital video signals are 8 bits / sample, this delay circuit 102 can consist of eight pieces of the shift register transmitted one by one by 910 steps with the clock of frequency 4fs.
[0033] And the output of a band pass filter 101 and the output of the 1st delay circuit 102 are supplied to the 1st subtractor circuit 103 and adder circuit 104, respectively. Since the output of a band pass filter 101 is a carrier chrominance signal band component, the level of the output y of the 1st subtractor circuit 103 and the level of the output x of an adder circuit 104 become a thing according to the perpendicular functionality between the output of a band pass filter 101, and the output of the 1st delay circuit 102.
[0034] Of course, when perpendicular functionality is between the output of a band pass filter 101, and the output of the 1st delay circuit 102, as an output of the 1st subtractor circuit 104, the carrier chrominance signal output is obtained good. The output of this 1st subtractor circuit 104 is supplied to the input edge B side of the change-over-switch circuit 107 for taking out the carrier chrominance signal DC to output through a delay circuit 106. A delay circuit 106 is a thing for timing doubling with the signal inputted into the input edge A side of the change-over-switch circuit 107, and has the amount of delay of a delayed part in the 1st subtractor circuit 103, and the delayed sum in the band pass filter 105 mentioned later.
[0035] And the signal of the carrier chrominance signal band where the output of a band pass filter 101 was further band-limited with the band pass filter 105 is supplied to the input edge A of the change-over-switch circuit 107. From the output of a band pass filter 101, a band pass filter 105 can be band-limited in order to remove a luminance-signal component further, and this can also omit it.
[0036] The change-over-switch circuit 107 is switched by the change-over selection signal SEL generated based on the existence of perpendicular functionality as is the following.
[0037] That is, the output x of an adder circuit 104 and the output y of the 1st subtractor circuit 103 are supplied to the absolute value-ized circuits 111 and 113, respectively, and each absolute value is calculated. The output of the absolute value-ized circuits 111 and 113 is supplied to low pass filters 112 and 114, respectively, and signal |x| and |y| which change gently-sloping are obtained from

these, respectively.
[0038] And signal |x| and |y| from these low pass filters 112 and 114 are supplied to the correlation operation part 115. In this correlation operation part 115, the evaluation operation by the valuation plan shown in Table 1 of drawing 4 is performed, and a binary signal k0, i.e., a 1-bit evaluation signal, is outputted as that evaluation output.
[0039] In this case, if the perpendicular functionality between the output of a band pass filter 101 and the output of the 1st delay circuit 102 is high, the output of the output y of a subtractor circuit 103 will become large as compared with the output x of an adder circuit 104. On the contrary, if the perpendicular functionality between the output of a band pass filter 101 and the output of the 1st delay circuit 102 is low, the output x of an adder circuit 104 will become large as compared with the output y of a subtractor circuit 103. The value of the integer "N" in the valuation plan of drawing 4 is for defining the criteria which distinguish the existence of perpendicular correlation, and is set to N= 4 in this example, for example.
[0040] That is, if the output level of a subtractor circuit 103 is large as compared with the output level of an adder circuit 104 to extent which is satisfied with this example of $|y|/4 >= |x|$, it will estimate that there is perpendicular functionality and the evaluation signal k0 will be set to "1." Moreover, if the output level of a subtractor circuit 103 is small to extent with which are satisfied of $|y|/4 < |x|$ as compared with the output level of an adder circuit 104, it will estimate that there is no perpendicular functionality and the evaluation signal k0 will be set to "0."
[0041] The evaluation signal k0 which is the output of this correlation detecting element 115 is supplied to operation part 117 as it is. Moreover, the evaluation signal k0 from the correlation detecting element 115 is supplied to operation part 117 as a signal k1 which carried out 1 level period delay through the 2nd delay circuit 116. In the case of this example, only 1 level period can be delayed and this 2nd delay circuit 116 can constitute the 1-bit evaluation signal k0 from one of 910 steps of shift registers a frequency is easy to drive with the clock of 4fs(es).
[0042] In this case, the evaluation signal k0 shows the existence of the perpendicular functionality of the carrier chrominance signal between the scanning line under current input, and the scanning line in front of 1 level period, and a signal k1 shows the existence of the perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period, and the scanning line in front of 2 level period. That is, the evaluation signals k0 and k1 show the perpendicular functionality between 3 horizontal-scanning lines.
[0043] Operation part 117 performs the operation which can obtain the result of an operation as shown in the table of truth value of Table 2 of drawing 5 in response to these evaluation signals k0 and k1, and generates the change-over selection signal SEL of the switching circuit 107 mentioned above as the result of an operation. Table 3 of drawing 6 shows the relation between this change-over selection signal SEL and the change-over condition of the change-over-switch circuit 107. That is, when Signal SEL is "1", the change-over-switch circuit 107 is switched to the input edge A side so that the output of a band pass filter 105 may be chosen, and when Signal SEL is "0", the change-over-switch circuit 107 is switched to the input edge B side so that the output of the 1st subtractor circuit 103 may be chosen.
[0044] Therefore, when the table of truth value of Table 2 is followed, there is no perpendicular functionality of the carrier chrominance signal between the scanning line under current input and the scanning line in front of 1 level period. And when there is perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period and the scanning line in front of 2 level period, the change-over-switch circuit 107 chooses the output of a band pass filter 105, and chooses the output of the 1st subtractor circuit 103 at the time of others.
[0045] Accommodative switch actuation in this change-over-switch circuit 107 is further explained with reference to drawing 2 .
[0046] Drawing 2 (A) shows the phase of the carrier chrominance signal in each level section in the output a of a band pass filter 101. Although a phase is reversed for every 1 level period in drawing 2 when a part for the 5 level sections is shown and perpendicular functionality exists about the carrier chrominance signal, in the example of this drawing 2 , between the 2nd level section and the 3rd level section, the phase of a carrier chrominance signal is reversed from the left, and it is in the condition that there is no perpendicular functionality.

[0047] At this time, the condition of each level section in the output b of the 1st delay circuit 102 will be in the condition of drawing 2 (B). Moreover, the condition that 1 level period (it is indicated as 1H by a diagram) delay is carried out is shown in a pan rather than it at drawing 2 (C).
[0048] Since addition with an output a and an output b is performed in an adder circuit 104, the output x serves as a signal of big level, when it comes to be shown in drawing 2 (D) and an output a does not have a signal in front of 1 level period, and correlation. Moreover, since subtraction with an output a and an output b is performed in the 1st subtractor circuit 103, the output y serves as a signal of small level, when it comes to be shown in drawing 2 (E) and an output a does not have a signal in front of 1 level period, and correlation.
[0049] It seems that therefore, the evaluation signals k0 and k1 as a result of having calculated the valuation plan of drawing 4 mentioned above by the correlation detecting element 115 are shown in drawing 2 (F). And the output SEL as a result of the operation according to the table of truth value of drawing 5 in operation part 117 is also shown in drawing 2 (F).
[0050] Consequently, since the change-over-switch circuit 107 will come to choose the output of a band pass filter 105 to a suitable carrier chrominance signal no longer being acquired like drawing 2 </A> according to the gestalt of this operation if an output y is chosen from the change-over-switch circuit 107 when the signal in front of 1 level period and correlation do not have an output a, as shown in drawing 2 (G), an always suitable carrier chrominance signal output comes to be obtained.
[0051] In addition, in this example, as shown in the table of truth value of drawing 5 , even if it is a time of there being no perpendicular functionality of the carrier chrominance signal between the scanning line under present input and the scanning line in front of 1 level period, when there is also no perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period and the scanning line in front of 2 level period, the output of the 1st subtractor circuit 103 is chosen, without choosing the output of a band pass filter 105. This is for making it not degrade slanting resolution.
[0052] Namely, in the part in which the slanting line is contained in the pattern of a screen, both the perpendicular functionality of the carrier chrominance signal between the scanning line between the scanning line under current input and the scanning line in front of 1 level period and in front of 1 level period and the scanning line in front of 2 level period will be in the condition that there is nothing. If the output of a band pass filter 105 is chosen as a carrier chrominance signal output at this time, the about 3.58MHz component of a luminance signal will be contained in the carrier chrominance signal output concerned, and will produce a cross color (stripes of light and darkness). On the other hand, the luminance-signal component is removed with the output of the 1st subtractor circuit 103. Then, in this example, when it is judged that there is no perpendicular correlation between 3 horizontal-scanning lines in this way, the output of the 1st subtractor circuit 103 is chosen as a carrier chrominance signal output so that a cross color can be prevented.
[0053] In this way, the digital carrier chrominance signal SC acquired from the change-over-switch circuit 107 is supplied to the 2nd subtractor circuit 109. Moreover, the digital composite color video signal from A/D converter 25 is supplied to this 2nd subtractor circuit 109 through the 2nd delay circuit 108. The 2nd delay circuit 108 is for carrying out timing doubling with the output timing of the carrier chrominance signal SC from the change-over-switch circuit 107, and has the amount of delay of the part of a band pass filter 101, the 1st subtractor circuit 103, and a delay circuit 106.
[0054] In the 2nd subtractor circuit 109, the digital carrier chrominance signal SC is subtracted from a digital composite color video signal, and the digital luminance signal SY is acquired from this.
[0055] After horizontal frequency characteristics are amended by horizontal frequency-characteristics amendment circuit 120Y, the digital luminance signal SY from this 2nd subtractor circuit 109 is supplied to D/A-converter 26Y, and is returned to the analog luminance signal Y.
[0056] Moreover, after horizontal frequency characteristics are amended by horizontal frequency-characteristics amendment circuit 120C, the digital carrier chrominance signal SC from the change-over-switch circuit 107 is supplied to D/A-converter 26C, and is returned to the analog carrier chrominance signal C.
[0057] As it explained above, according to the Cush form filter of the gestalt of this operation, according to the perpendicular functionality between 3 horizontal-scanning lines, a carrier chrominance signal output can be obtained accommodative. And in the Cush form filter of the gestalt

of this operation, the delay circuit of 1 level period becomes that what is necessary is just to be good in the delay circuit 102 of the signal of a 8-bit carrier chrominance signal band, and the delay circuit 116 of the 1-bit evaluation signal k0, and to prepare the delay circuit of 1 level period for a 9-bit signal in total. For this reason, compared with the case where two delay circuits of a 8-bit signal are prepared, a circuit scale can be made small like before.

[0058] Moreover, the circuit part which detects the existence of perpendicular functionality That what is necessary is to prepare only about I/O of a delay circuit 102 like before The correlation detecting element about the perpendicular functionality of the carrier chrominance signal between the scanning line under current input, and the scanning line in front of 1 level period, While being able to simplify a configuration compared with the case where a correlation detecting element is prepared, about the perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period, and the scanning line in front of 2 level period, it becomes contraction of a circuit scale.

[0059] Although the above explained the case where the Cush form filter by this invention was applied to a television receiver, this invention is applicable also to other visual equipments. Drawing 7 shows the configuration of VTR with which the Cush form filter by this invention was applied.

[0060] That is, after being changed into a digital composite color video signal with A/D converter 32, the composite color video signal inputted through the image input terminal 31 is supplied to the ecad Cush form filter 33 constituted with the Cush form filter 100 of the configuration of drawing 1 mentioned above, and the digital luminance signal DY and the digital carrier chrominance signal DC are separated as mentioned above, and it is outputted.

[0061] The digital luminance signal DY from this ecad Cush form filter 33 and the digital carrier chrominance signal DC are returned to an analog luminance signal and the analog carrier chrominance signal C by D/A converters 34Y and 34C, respectively. And these luminance signals and a carrier chrominance signal are supplied to the record processing circuit 35, FM modulation of the luminance signal is carried out, and frequency multiplex [of the carrier chrominance signal] is carried out to the low-pass side of this luminance signal by which FM modulation was carried out. And this frequency multiple signal is supplied to a rotary head 36, and is recorded on a magnetic tape.

[0062] In addition, in the gestalt of above-mentioned operation, although the Cush form filter is a digital circuit and the A/D converter and the D/A converter were made into the external thing, of course, it can also perform considering as a configuration equipped also with an A/D converter and a D/A converter.

[0063] Moreover, it cannot be overemphasized that the Cush form filter can be considered as the configuration of an analog circuit instead of the configuration of a digital circuit, either.

[0064]

[Effect of the Invention] As explained above, according to this invention, it is a small circuit scale and circuitry [****] can realize the Cush form filter which obtains a carrier chrominance signal output accommodative according to the perpendicular functionality between 3 horizontal-scanning lines.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to visual equipments carrying the Cush form filter which separates and outputs a luminance signal and a carrier chrominance signal from a composite color video signal, and this Cush form filter, such as for example, a color-television receiving set and VTR.

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PRIOR ART

[Description of the Prior Art] For example, in a television receiver, in order to obtain the output image by the received composite color video signal, it is necessary to separate a luminance signal and a carrier chrominance signal. Moreover, with VTR, an input composite color video signal is divided into a luminance signal and a carrier chrominance signal, a luminance signal carries out FM modulation, frequency conversion of the carrier chrominance signal is carried out, and it is recorded on the low-pass side of FM luminance signal.
[0003] The Cush form filter which used that the functionality of the perpendicular direction of the screen of a color video signal and the phase of a chrominance subcarrier were reversed for every 1 level period as an approach of separating a luminance signal and a carrier chrominance signal from a composite color video signal as mentioned above is often used recently. This is because there is an advantage which can avoid generating of this cross color, when the luminance signal and the carrier chrominance signal were separated using band-pass filters, such as a band pass filter, and the Cush form filter is used to degradation of the image with which the high-frequency component of the luminance signal included in the band of a carrier chrominance signal mixes in a carrier chrominance signal, and is called a cross color occurring.
[0004] Drawing 8 shows the fundamental circuitry of this Cush form filter.
[0005] That is, the luminance signal Y inputted from an input terminal 11 and the composite color video signal Sa including a carrier chrominance signal C are supplied to the delay circuit 12 of 1 level period, and after 1 level period delay is carried out, they are supplied to the 1st subtractor circuit 13. The composite color video signal Sa from an input terminal 11 is directly supplied to the 1st subtractor circuit 13 again.
[0006] If a subtraction operation is performed in this subtractor circuit 13, since a luminance-signal component has the almost the same signal of the ****** level section, the luminance-signal component concerned will be negated from the perpendicular functionality of a video signal. On the other hand, since the phase of a chrominance subcarrier is reversed for every 1 level period, in a subtractor circuit 13, it becomes in phase [the chrominance-subcarrier component of the adjacent level section], and, for this reason, only a carrier chrominance signal component is obtained from a subtractor circuit 13. And the band pass filter 14 which makes a passband 3.58MHz**500kHz (in the case of an NTSC signal) is supplied, a carrier chrominance signal C is taken out from this band pass filter 14, and the carrier chrominance signal component from this subtractor circuit 13 is drawn by output terminal 17C.
[0007] On the other hand, the composite color video signal Sa inputted through the input terminal 11 is supplied to the 2nd subtractor circuit 16 through a delay circuit 15. A delay circuit 15 is a thing for timing doubling with the carrier chrominance signal C outputted from a band pass filter 14, and is delayed in the sum of delay of 1 level period by the 1st delay circuit 12, and delay with a subtractor circuit 13 and a band pass filter 14.
[0008] And the carrier chrominance signal C acquired from a band pass filter 14 is supplied to the 2nd subtractor circuit 16, and it subtracts from a composite color video signal. Therefore, a luminance signal Y is acquired and it is drawn from the 2nd subtractor circuit 16 by output terminal 17Y. According to the Cush form filter as mentioned above, generating of a cross color can be avoided and a luminance signal Y and a carrier chrominance signal C can be separated from a composite color video signal.

[0009] However, since there is no perpendicular functionality of a carrier chrominance signal in the scanning line which the phase of a carrier chrominance signal reversed when a composite color video signal which changes to the horizontal scanning line of the contents of a signal which the phase of a carrier chrominance signal reversed is inputted into the above-mentioned Cush form filter, for example from the horizontal scanning line which is the flat contents of a screen uniformly, it cannot dissociate completely and a carrier chrominance signal cannot be taken out from a composite color video signal. For this reason, a carrier chrominance signal component remains to the luminance signal Y of output terminal 17Y in this scanning line, and the so-called dot active jamming occurs in it.

[0010] Moreover, in the carrier chrominance signal C drawn by output terminal 17C, the signal level in the scanning line concerned fell, and there was also a problem on which the vertical definition of a carrier chrominance signal deteriorates.

[0011] To this problem, these people supervised the adjacent perpendicular functionality for three lines, and, so to speak, the Cush form filter of an ecad is proposed between Rhine with perpendicular functionality using the luminance signal and carrier chrominance signal output which were separated with the Cush form filter having used the luminance signal and carrier chrominance signal output which were separated with the band pass filter at the time of Rhine without perpendicular functionality (for example, reference, such as JP,3-70383,A).

[0012] According to this, generating of dot active jamming is avoidable by making into an output signal the luminance signal and carrier chrominance signal which were separated with the band pass filter in the scanning line without perpendicular functionality about the carrier chrominance signal.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, it is a small circuit scale and circuitry [****] can realize the Cush form filter which obtains a carrier chrominance signal output accommodative according to the perpendicular functionality between 3 horizontal-scanning lines.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, since it is necessary to supervise perpendicular functionality of the video signal between 3 horizontal-scanning lines in the case of an above-mentioned ecad Cush form filter, The signal which carried out 1 level period delay to the present input signal using two delay circuits delayed in 1 level period about the composite color video signal as shown in said official report etc., He generates the signal which carried out 2 level period delay, and is trying to supervise the perpendicular functionality between the perpendicular functionality between the signals which carried out 1 level period delay with the present input signal and the signal which carried out 1 level period delay, and the signal which carried out 2 level period delay, respectively.
[0014] Thus, in the configuration of the conventional ecad Cush form filter, since the delay circuit of two 1 level periods for which a composite color video signal is delayed was needed, there was a problem that a circuit scale will become large, comparatively. Moreover, since it was the configuration separately equipped with the circuit which supervises the perpendicular functionality between the circuit which supervises the perpendicular functionality between the signals which carried out 1 level period delay with the present input signal, the signal which carried out 1 level period delay, and the signal which carried out 2 level period delay, respectively, circuitry was complicated.
[0015] In view of the above point, this invention has a small circuit scale compared with the former, and aims at offering the ecad Cush form filter which can also simplify a configuration.

[Translation done.]

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the Cush form filter by this invention The 1st delay circuit which carries out 1 level period delay of this composite color video signal in response to a composite color video signal including a luminance signal and a carrier chrominance signal, The band pass filter which extracts and outputs said carrier chrominance signal component from this composite color video signal in response to said composite color video signal, The 1st subtractor circuit which obtains the subtraction output of the output signal of said band pass filter, and the output signal of said 1st delay circuit, The adder circuit which obtains the subtraction output of the output signal of said band pass filter, and the output signal of said 1st delay circuit, The change-over circuit which switches and outputs the output of said band pass filter, and the output of said 1st subtractor circuit, The correlation detector which outputs the binary signal which undergoes the output of said 1st subtractor circuit, and the output of said adder circuit, and shows the existence of correlation with the output signal of said band pass filter, and the output signal of said 1st delay circuit based on the relation of both outputs, The 2nd delay circuit which carries out 1 level period delay of said binary signal from said correlation detector, Said binary signal from said correlation detector and the signal from said 2nd delay circuit are received, and it has the arithmetic circuit which outputs the selection signal which switches and controls said change-over circuit from the result of an operation of both signals, and is characterized by acquiring a carrier chrominance signal from said change-over circuit.
[0017] In the Cush form filter by this invention of the above-mentioned configuration, the frequency band component of a carrier chrominance signal is extracted from a composite color video signal by the band pass filter, the output signal of this band pass filter is supplied to the 1st delay circuit, and 1 level period delay is carried out. And the signal of the I/O edge of this 1st delay circuit is subtracted in the 1st subtractor circuit, and a carrier chrominance signal is taken out from this 1st subtractor circuit.
[0018] And while the output signal of this 1st subtractor circuit is supplied to a correlation detector, the signal of the I/O edge of the 1st delay circuit is supplied to an adder circuit, and the output signal of this adder circuit is supplied to a correlation detector.
[0019] When perpendicular functionality is in a carrier chrominance signal, as an output signal of the 1st subtractor circuit, the carrier chrominance signal concerned is acquired on comparatively big level, and, on the other hand, the output of the small level against which the carrier chrominance signal of 2 level period was set off is obtained as an output signal of an adder circuit.
[0020] On the contrary, there is no perpendicular functionality in a carrier chrominance signal, for example, when a phase is opposition, the output signal of the 1st subtractor circuit serves as small level, and, on the other hand, the output signal of an adder circuit becomes large.
[0021] In a correlation detector, based on the above-mentioned relation of the output of the 1st above-mentioned subtractor circuit, and the output of an adder circuit, the existence of the perpendicular functionality of the carrier chrominance signal between 2 horizontal-scanning lines is detected, and the binary signal of the detection output is outputted.
[0022] The binary signal as a detection output of the existence of this perpendicular functionality is supplied to an arithmetic circuit through the 2nd delay circuit while it is supplied to an arithmetic circuit as it is. An arithmetic circuit acquires the information on the perpendicular functionality between 3 horizontal-scanning lines from the binary signal of I/O of this 2nd delay circuit. And

based on the relation of the existence of the perpendicular functionality between this 3 horizontal-scanning line, an arithmetic circuit performs change-over control of the change-over circuit which switches and outputs the output of a band pass filter, and the output of the 1st subtractor circuit.
[0023] What is necessary is just to prepare one of the 1st delay circuit as an object for delay of the signal of a carrier chrominance signal band in this above-mentioned invention. And since the 2nd delay circuit delayed in the output of a correlation detector should just be delayed in a binary signal, the thing of an easy configuration can be used for it. Moreover, a correlation detector can be managed with one about a part for the signal of 2 horizontal scanning lines of I/O of the 1st delay circuit.
[0024]
[Embodiment of the Invention] Hereafter, the Cush form filter by this invention is explained with reference to drawing about the gestalt of operation at the time of applying to a color-television receiving set.
[0025] First, the outline of the configuration of a color-television receiving set in which the Cush form filter of the gestalt of this operation is applied is shown in drawing 3 .
[0026] That is, the television broadcasting signal received with TV antenna 21 is supplied to a tuner 22, and the broadcast signal of the channel according to channel selection actuation of a user is changed into an image intermediate frequency signal. The image intermediate frequency signal from this tuner 22 is supplied to a video detector 24 through a video IF amplifier 23, and a composite color video signal restores to it.
[0027] In this example, after this composite color video signal is changed into a digital signal by A/D converter 25, it is supplied to the ecad Cush form filter 100 with which the Cush form filter of the gestalt of this operation mentioned later is applied, and is divided into the luminance signal DY and carrier chrominance signal DC of a condition of a digital signal. The digital outputs DY and DC of this Cush form filter 100 are supplied to D/A converters 26Y and 26C, respectively, and are returned to the luminance signal Y and carrier chrominance signal C of an analog signal.
[0028] And a luminance signal Y is supplied to the matrix circuit 28 as it is. Moreover, a carrier chrominance signal C is supplied to the chroma decoder 27, and color-difference-signal R-Y and B-Y are decoded. And these color-difference-signals R-Y and B-Y are supplied to the matrix circuit 28.

[0029] The matrix circuit 28 generates the three-primary-colors signals R, G, and B from the luminance signal Y inputted into this, color-difference-signal R-Y, and B-Y, supplies these signals R, G, and B to the color cathode-ray tube 29, and reproduces an image on the screen.
 [0030] Next, the Cush form filter of the gestalt of this operation is explained with reference to drawing 1 and drawing 2 . Drawing 1 shows the circuitry of the Cush form filter of the gestalt of this operation, and drawing 2 is a timing diagram for explaining circuit actuation of this Cush form filter.
[0031] Although a composite color video signal is digitized in A/D converter 25 as mentioned above, in the case of this example, sampling frequencies are 4fs(es) (fs is a chrominance-subcarrier frequency and, in the case of NTSC system, is about 3.58MHz), and a composite color video signal is made into the digital signal of 8 bits / 1 sample. This digital composite color video signal is supplied to a band pass filter 101, and the component of the frequency band of a carrier chrominance signal is extracted now.
[0032] The output of a band pass filter 101 is supplied to the 1st delay circuit 102, and 1 level period delay is carried out. In this example, a digital video signal serves as about 910 samples per 1 level period, and since digital video signals are 8 bits / sample, this delay circuit 102 can consist of eight pieces of the shift register transmitted one by one by 910 steps with the clock of frequency 4fs.
[0033] And the output of a band pass filter 101 and the output of the 1st delay circuit 102 are supplied to the 1st subtractor circuit 103 and adder circuit 104, respectively. Since the output of a band pass filter 101 is a carrier chrominance signal band component, the level of the output y of the 1st subtractor circuit 103 and the level of the output x of an adder circuit 104 become a thing according to the perpendicular functionality between the output of a band pass filter 101, and the output of the 1st delay circuit 102.
[0034] Of course, when perpendicular functionality is between the output of a band pass filter 101, and the output of the 1st delay circuit 102, as an output of the 1st subtractor circuit 104, the carrier

chrominance signal output is obtained good. The output of this 1st subtractor circuit 104 is supplied to the input edge B side of the change-over-switch circuit 107 for taking out the carrier chrominance signal DC to output through a delay circuit 106. A delay circuit 106 is a thing for timing doubling with the signal inputted into the input edge A side of the change-over-switch circuit 107, and has the amount of delay of a delayed part in the 1st subtractor circuit 103, and the delayed sum in the band pass filter 105 mentioned later.

[0035] And the signal of the carrier chrominance signal band where the output of a band pass filter 101 was further band-limited with the band pass filter 105 is supplied to the input edge A of the change-over-switch circuit 107. From the output of a band pass filter 101, a band pass filter 105 can be band-limited in order to remove a luminance-signal component further, and this can also omit it.

[0036] The change-over-switch circuit 107 is switched by the change-over selection signal SEL generated based on the existence of perpendicular functionality as is the following.

[0037] That is, the output x of an adder circuit 104 and the output y of the 1st subtractor circuit 103 are supplied to the absolute value-ized circuits 111 and 113, respectively, and each absolute value is calculated. The output of the absolute value-ized circuits 111 and 113 is supplied to low pass filters 112 and 114, respectively, and signal |x| and |y| which change gently-sloping are obtained from these, respectively.

[0038] And signal |x| and |y| from these low pass filters 112 and 114 are supplied to the correlation operation part 115. In this correlation operation part 115, the evaluation operation by the valuation plan shown in Table 1 of drawing 4 is performed, and a binary signal k0, i.e., a 1-bit evaluation signal, is outputted as that evaluation output.

[0039] In this case, if the perpendicular functionality between the output of a band pass filter 101 and the output of the 1st delay circuit 102 is high, the output of the output y of a subtractor circuit 103 will become large as compared with the output x of an adder circuit 104. On the contrary, if the perpendicular functionality between the output of a band pass filter 101 and the output of the 1st delay circuit 102 is low, the output x of an adder circuit 104 will become large as compared with the output y of a subtractor circuit 103. The value of the integer "N" in the valuation plan of drawing 4 is for defining the criteria which distinguish the existence of perpendicular correlation, and is set to N= 4 in this example, for example.

[0040] That is, if the output level of a subtractor circuit 103 is large as compared with the output level of an adder circuit 104 to extent which is satisfied with this example of $|y|/4 >= |x|$, it will estimate that there is perpendicular functionality and the evaluation signal k0 will be set to "1." Moreover, if the output level of a subtractor circuit 103 is small to extent with which are satisfied of $|y|/4 < |x|$ as compared with the output level of an adder circuit 104, it will estimate that there is no perpendicular functionality and the evaluation signal k0 will be set to "0."

[0041] The evaluation signal k0 which is the output of this correlation detecting element 115 is supplied to operation part 117 as it is. Moreover, the evaluation signal k0 from the correlation detecting element 115 is supplied to operation part 117 as a signal k1 which carried out 1 level period delay through the 2nd delay circuit 116. In the case of this example, only 1 level period can be delayed and this 2nd delay circuit 116 can constitute the 1-bit evaluation signal k0 from one of 910 steps of shift registers a frequency is easy to drive with the clock of 4fs(es).

[0042] In this case, the evaluation signal k0 shows the existence of the perpendicular functionality of the carrier chrominance signal between the scanning line under current input, and the scanning line in front of 1 level period, and a signal k1 shows the existence of the perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period, and the scanning line in front of 2 level period. That is, the evaluation signals k0 and k1 show the perpendicular functionality between 3 horizontal-scanning lines.

[0043] Operation part 117 performs the operation which can obtain the result of an operation as shown in the table of truth value of Table 2 of drawing 5 in response to these evaluation signals k0 and k1, and generates the change-over selection signal SEL of the switching circuit 107 mentioned above as the result of an operation. Table 3 of drawing 6 shows the relation between this change-over selection signal SEL and the change-over condition of the change-over-switch circuit 107. That is, when Signal SEL is "1", the change-over-switch circuit 107 is switched to the input edge A side so that the output of a band pass filter 105 may be chosen, and when Signal SEL is "0", the change-

over-switch circuit 107 is switched to the input edge B side so that the output of the 1st subtractor circuit 103 may be chosen.
[0044] Therefore, when the table of truth value of Table 2 is followed, there is no perpendicular functionality of the carrier chrominance signal between the scanning line under current input and the scanning line in front of 1 level period. And when there is perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period and the scanning line in front of 2 level period, the change-over-switch circuit 107 chooses the output of a band pass filter 105, and chooses the output of the 1st subtractor circuit 103 at the time of others.
[0045] Accommodative switch actuation in this change-over-switch circuit 107 is further explained with reference to drawing 2 .
[0046] Drawing 2 (A) shows the phase of the carrier chrominance signal in each level section in the output a of a band pass filter 101. Although a phase is reversed for every 1 level period in drawing 2 when a part for the 5 level sections is shown and perpendicular functionality exists about the carrier chrominance signal, in the example of this drawing 2 , between the 2nd level section and the 3rd level section, the phase of a carrier chrominance signal is reversed from the left, and it is in the condition that there is no perpendicular functionality.
[0047] At this time, the condition of each level section in the output b of the 1st delay circuit 102 will be in the condition of drawing 2 (B). Moreover, the condition that 1 level period (it is indicated as 1H by a diagram) delay is carried out is shown in a pan rather than it at drawing 2 (C).
[0048] Since addition with an output a and an output b is performed in an adder circuit 104, the output x serves as a signal of big level, when it comes to be shown in drawing 2 (D) and an output a does not have a signal in front of 1 level period, and correlation. Moreover, since subtraction with an output a and an output b is performed in the 1st subtractor circuit 103, the output y serves as a signal of small level, when it comes to be shown in drawing 2 (E) and an output a does not have a signal in front of 1 level period, and correlation.
[0049] It seems that therefore, the evaluation signals k0 and k1 as a result of having calculated the valuation plan of drawing 4 mentioned above by the correlation detecting element 115 are shown in drawing 2 (F). And the output SEL as a result of the operation according to the table of truth value of drawing 5 in operation part 117 is also shown in drawing 2 (F).
[0050] Consequently, since the change-over-switch circuit 107 will come to choose the output of a band pass filter 105 to a suitable carrier chrominance signal no longer being acquired like drawing 2 according to the gestalt of this operation if an output y is chosen from the change-over-switch circuit 107 when the signal in front of 1 level period and correlation do not have an output a, as shown in drawing 2 (G), an always suitable carrier chrominance signal output comes to be obtained.
[0051] In addition, in this example, as shown in the table of truth value of drawing 5 , even if it is a time of there being no perpendicular functionality of the carrier chrominance signal between the scanning line under present input and the scanning line in front of 1 level period, when there is also no perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period and the scanning line in front of 2 level period, the output of the 1st subtractor circuit 103 is chosen, without choosing the output of a band pass filter 105. This is for making it not degrade slanting resolution.
[0052] Namely, in the part in which the slanting line is contained in the pattern of a screen, both the perpendicular functionality of the carrier chrominance signal between the scanning line between the scanning line under current input and the scanning line in front of 1 level period and in front of 1 level period and the scanning line in front of 2 level period will be in the condition that there is nothing. If the output of a band pass filter 105 is chosen as a carrier chrominance signal output at this time, the about 3.58MHz component of a luminance signal will be contained in the carrier chrominance signal output concerned, and will produce a cross color (stripes of light and darkness). On the other hand, the luminance-signal component is removed with the output of the 1st subtractor circuit 103. Then, in this example, when it is judged that there is no perpendicular correlation between 3 horizontal-scanning lines in this way, the output of the 1st subtractor circuit 103 is chosen as a carrier chrominance signal output so that a cross color can be prevented.
[0053] In this way, the digital carrier chrominance signal SC acquired from the change-over-switch circuit 107 is supplied to the 2nd subtractor circuit 109. Moreover, the digital composite color video

signal from A/D converter 25 is supplied to this 2nd subtractor circuit 109 through the 2nd delay circuit 108. The 2nd delay circuit 108 is for carrying out timing doubling with the output timing of the carrier chrominance signal SC from the change-over-switch circuit 107, and has the amount of delay of the part of a band pass filter 101, the 1st subtractor circuit 103, and a delay circuit 106.
[0054] In the 2nd subtractor circuit 109, the digital carrier chrominance signal SC is subtracted from a digital composite color video signal, and the digital luminance signal SY is acquired from this.
[0055] After horizontal frequency characteristics are amended by horizontal frequency-characteristics amendment circuit 120Y, the digital luminance signal SY from this 2nd subtractor circuit 109 is supplied to D/A-converter 26Y, and is returned to the analog luminance signal Y.
[0056] Moreover, after horizontal frequency characteristics are amended by horizontal frequency-characteristics amendment circuit 120C, the digital carrier chrominance signal SC from the change-over-switch circuit 107 is supplied to D/A-converter 26C, and is returned to the analog carrier chrominance signal C.
[0057] As it explained above, according to the Cush form filter of the gestalt of this operation, according to the perpendicular functionality between 3 horizontal-scanning lines, a carrier chrominance signal output can be obtained accommodative. And in the Cush form filter of the gestalt of this operation, the delay circuit of 1 level period becomes that what is necessary is just to be good in the delay circuit 102 of the signal of a 8-bit carrier chrominance signal band, and the delay circuit 116 of the 1-bit evaluation signal k0, and to prepare the delay circuit of 1 level period for a 9-bit signal in total. For this reason, compared with the case where two delay circuits of a 8-bit signal are prepared, a circuit scale can be made small like before.
[0058] Moreover, the circuit part which detects the existence of perpendicular functionality That what is necessary is to prepare only about I/O of a delay circuit 102 like before The correlation detecting element about the perpendicular functionality of the carrier chrominance signal between the scanning line under current input, and the scanning line in front of 1 level period, While being able to simplify a configuration compared with the case where a correlation detecting element is prepared, about the perpendicular functionality of the carrier chrominance signal between the scanning line in front of 1 level period, and the scanning line in front of 2 level period, it becomes contraction of a circuit scale.
[0059] Although the above explained the case where the Cush form filter by this invention was applied to a television receiver, this invention is applicable also to other visual equipments. Drawing 7 shows the configuration of VTR with which the Cush form filter by this invention was applied.
[0060] That is, after being changed into a digital composite color video signal with A/D converter 32, the composite color video signal inputted through the image input terminal 31 is supplied to the ecad Cush form filter 33 constituted with the Cush form filter 100 of the configuration of drawing 1 mentioned above, and the digital luminance signal DY and the digital carrier chrominance signal DC are separated as mentioned above, and it is outputted.
[0061] The digital luminance signal DY from this ecad Cush form filter 33 and the digital carrier chrominance signal DC are returned to an analog luminance signal and the analog carrier chrominance signal C by D/A converters 34Y and 34C, respectively. And these luminance signals and a carrier chrominance signal are supplied to the record processing circuit 35, FM modulation of the luminance signal is carried out, and frequency multiplex [of the carrier chrominance signal] is carried out to the low-pass side of this luminance signal by which FM modulation was carried out. And this frequency multiple signal is supplied to a rotary head 36, and is recorded on a magnetic tape.
[0062] In addition, in the gestalt of above-mentioned operation, although the Cush form filter is a digital circuit and the A/D converter and the D/A converter were made into the external thing, of course, it can also perform considering as a configuration equipped also with an A/D converter and a D/A converter.
[0063] Moreover, it cannot be overemphasized that the Cush form filter can be considered as the configuration of an analog circuit instead of the configuration of a digital circuit, either.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the circuit diagram of the gestalt of 1 operation of the Cush form filter by this invention.
[Drawing 2] It is drawing showing the timing diagram for explaining the gestalt of operation of drawing 1 .
[Drawing 3] It is the block diagram showing the configuration of an example of the color-television receiving set using the Cush form filter by this invention.
[Drawing 4] It is drawing used for explanation of the gestalt of operation of drawing 1 .
[Drawing 5] It is drawing used for explanation of the gestalt of operation of drawing 1 .
[Drawing 6] It is drawing used for explanation of the gestalt of operation of drawing 1 .
[Drawing 7] It is the block diagram showing the configuration of an example of VTR using the Cush form filter by this invention.
[Drawing 8] It is drawing explaining the basic configuration of the Cush form filter.
[Description of Notations]
25 [-- The delay circuit of 1 level period of a video signal, 103 / -- The 1st subtractor circuit, 104 / -- An adder circuit, 107 / -- A change-over-switch circuit, 109 / -- The 2nd subtractor circuit, 115 / -- A correlation detecting element, 116 / -- The delay circuit of 1 level period of a binary signal, 117 / -- Operation part] -- An A/D converter, 26Y, 26C -- A D/A converter, 101,105 -- The band pass filter, 102 which extract a carrier chrominance signal band

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[Translation done.]

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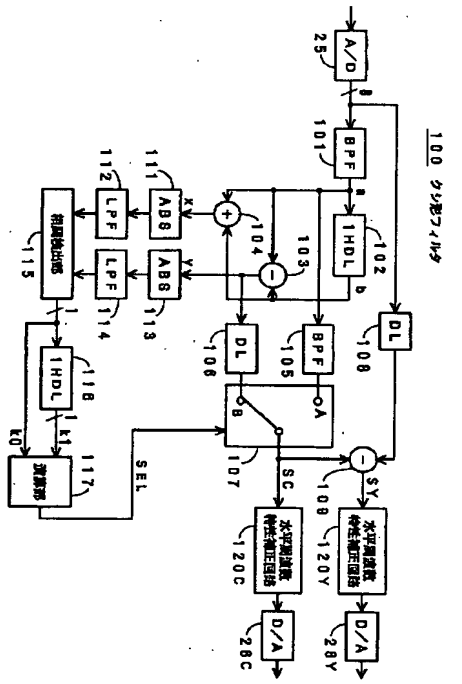
(54)【発明の名称】　クシ形フィルタおよび映像機器

(57)【要約】　（修正有）

【課題】　回路規模が小さく、構成も簡単な適応型クシ形フィルタを提供する。

【解決手段】　バンドパスフィルタ１０１により複合カラー映像信号から抽出した搬送色信号を第１の遅延回路１０２で１水平期間遅延する。第１の減算回路１０３で、バンドパスフィルタ１０１の出力信号と遅延回路１０２の出力信号との減算出力を得、加算回路１０４で、その加算出力を得る。第１の減算回路１０３の出力と、加算回路１０４の出力との関係に基づいて２値信号ｋ０を出力する相関検出回路１１５を設け、２値信号ｋ０と、２値信号ｋ０を第２の遅延回路１１６を通じて１水平期間遅延した信号ｋ１とを演算部１１７に供給する。演算部１１７は、信号ｋ０，ｋ１の演算結果から、バンドパスフィルタ１０１又は更に輝度信号成分除去のためのバンドパスフィルタ１０５の出力と第１の減算回路１０３の出力とを切り換え制御する選択信号を出力し、切換回路１０７から搬送色信号を得る。



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【特許請求の範囲】

【請求項１】複合カラー映像信号を受けて、この複合カラー映像信号から搬送色信号の周波数帯域成分を抽出して出力するバンドパスフィルタと、

前記バンドパスフィルタの出力を受けて、このバンドパスフィルタの出力を１水平期間遅延する第１の遅延回路と、

前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との減算出力を得る第１の減算回路と、

前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との加算出力を得る加算回路と、

前記バンドパスフィルタの出力と、前記第１の減算回路の出力とを切り換えて出力する切換回路と、

前記第１の減算回路の出力と、前記加算回路の出力とを受け、両出力の関係に基づいて、前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との相関の有無を示す２値信号を出力する相関検出回路と、

前記相関検出回路からの前記２値信号を１水平期間遅延する第２の遅延回路と、

前記相関検出回路からの前記２値信号と、前記第２の遅延回路からの信号とを受け、両信号の演算結果から前記切換回路を切り換え制御する選択信号を出力する演算回路と

を備え、前記切換回路から搬送色信号を得るようにしたことを特徴とするクシ形フィルタ。

【請求項２】前記複合カラー映像信号が供給され、前記複合カラー映像信号を遅延させる第３の遅延回路と、

前記第３の遅延回路の出力から、前記切換回路の出力を減算する第２の減算回路とを設け、前記第２の減算回路から輝度信号を得るようにすることを特徴とする請求項１に記載のクシ形フィルタ。

【請求項３】輝度信号と搬送色信号とを含む複合カラー映像信号を受けて、前記輝度信号と前記搬送色信号とを分離して出力するクシ形フィルタと、

このクシ形フィルタからの前記輝度信号と前記搬送色信号を処理する信号処理回路とを備える映像機器であって、

前記クシ形フィルタは、

前記複合カラー映像信号を受けて、この複合カラー映像信号から前記搬送色信号の周波数帯域成分を抽出して出力するバンドパスフィルタと、

前記バンドパスフィルタの出力を受けて、このバンドパスフィルタの出力を１水平期間遅延する第１の遅延回路と、

前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との減算出力を得る第１の減算回路と、

前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との減算出力を得る加算回路と、

前記バンドパスフィルタの出力と、前記第１の減算回路の出力とを切り換えて出力する切換回路と、

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前記第１の減算回路の出力と、前記加算回路の出力とを受け、両出力の関係に基づいて、前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との相関の有無を示す２値信号を出力する相関検出回路と、

前記相関検出回路からの前記２値信号を１水平期間遅延する第２の遅延回路と、

前記相関検出回路からの前記２値信号と、前記第２の遅延回路からの信号とを受け、両信号の演算結果から前記切換回路を切り換え制御する選択信号を出力する演算回路と、

前記複合カラー映像信号が供給され、前記複合カラー映像信号を遅延させる第３の遅延回路と、

前記第３の遅延回路の出力から、前記切換回路の出力を減算する第２の減算回路とを備え、前記切換回路から前記搬送色信号を得ると共に、前記第２の減算回路から前記輝度信号を得るようにすることを特徴とする映像機器。

【請求項４】請求項３に記載の映像機器において、前記クシ形フィルタはデジタル回路の構成とされ、前記バンドパスフィルタの前段にＡ／Ｄ変換器が設けられると共に、前記切換回路および第２の減算回路のそれぞれの後段にＤ／Ａ変換器が設けられ、前記第２の遅延回路は、１ビットの情報の遅延回路であることを特徴とする映像機器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、複合カラー映像信号から輝度信号と搬送色信号とを分離して出力するクシ形フィルタ、および、このクシ形フィルタを搭載する例えばカラーテレビジョン受像機やＶＴＲなどの映像機器に関する。

【０００２】

【従来の技術】例えば、テレビジョン受像機では、受信した複合カラー映像信号による出力画像を得るために、輝度信号と搬送色信号とを分離する必要がある。また、ＶＴＲでは、入力複合カラー映像信号を輝度信号と搬送色信号とに分離し、輝度信号はＦＭ変調し、搬送色信号は、ＦＭ輝度信号の低域側に周波数変換して記録するようにする。

【０００３】上述のように複合カラー映像信号から輝度信号と搬送色信号とを分離する方法として、カラー映像信号の画面の垂直方向の相関性と、色副搬送波の位相が１水平期間ごとに反転していることを利用したクシ形フィルタが、最近はよく使用される。これは、バンドパスフィルタなどの帯域フィルタを用いて輝度信号と搬送色信号を分離すると、搬送色信号の帯域内に含まれる輝度信号の高域成分が搬送色信号に混入し、クロスカラーと呼ばれる画像の劣化が発生するのに対し、クシ形フィルタを用いた場合には、このクロスカラーの発生を避けることができる利点があるためである。

【０００４】図８は、このクシ形フィルタの基本的な回路構成を示すものである。

【０００５】すなわち、入力端子１１から入力される輝度信号Ｙと搬送色信号Ｃとを含む複合カラー映像信号Ｓａは、１水平期間の遅延回路１２に供給されて、１水平期間遅延された後、第１の減算回路１３に供給される。入力端子１１からの複合カラー映像信号Ｓａは、また、直接に第１の減算回路１３に供給される。

【０００６】この減算回路１３で減算演算が行われると、映像信号の垂直相関性から、輝度信号成分は隣合う水平区間の信号がほとんど同じであることから、当該輝度信号成分は打ち消される。一方、色副搬送波の位相は、１水平期間ごとに反転しているため、隣り合う水平区間の色副搬送波成分は減算回路１３では同相となり、このため、減算回路１３からは搬送色信号成分のみが得られる。そして、この減算回路１３からの搬送色信号成分は、例えば３．５８ＭＨｚ±５００ｋＨｚ（ＮＴＳＣ信号の場合）を通過帯域とするバンドパスフィルタ１４に供給され、このバンドパスフィルタ１４から搬送色信号Ｃが取り出され、出力端子１７Ｃに導出される。

【０００７】一方、入力端子１１を通じて入力された複合カラー映像信号Ｓａは、遅延回路１５を通じて第２の減算回路１６に供給される。遅延回路１５は、バンドパスフィルタ１４から出力される搬送色信号Ｃとのタイミング合わせのためのもので、第１の遅延回路１２による１水平期間の遅延と、減算回路１３およびバンドパスフィルタ１４での遅延との和の遅延を行う。

【０００８】そして、第２の減算回路１６には、バンドパスフィルタ１４から得られる搬送色信号Ｃが供給されて、複合カラー映像信号から減算される。したがって、第２の減算回路１６からは輝度信号Ｙが得られ、それが出力端子１７Ｙに導出される。以上のようにして、クシ形フィルタによれば、複合カラー映像信号から、クロスカラーの発生を回避して、輝度信号Ｙと搬送色信号Ｃとを分離することができる。

【０００９】しかしながら、例えば一様に平坦な画面内容である水平走査線から、搬送色信号の位相が反転したような信号内容の水平走査線に変わるような複合カラー映像信号が、上記のクシ形フィルタに入力されると、搬送色信号の位相が反転した走査線において、搬送色信号の垂直相関性がないため、複合カラー映像信号より搬送色信号を完全に分離して取り出すことはできない。このため、この走査線における出力端子１７Ｙの輝度信号Ｙには、搬送色信号成分が残留し、いわゆるドット妨害が発生する。

【００１０】また、出力端子１７Ｃに導出される搬送色信号Ｃでは、当該走査線での信号レベルが低下して、搬送色信号の垂直解像度が劣化してしまう問題もあった。

【００１１】この問題に対して、本出願人は、隣り合う３ライン間の垂直相関性を監視し、垂直相関性のあるライン間では、クシ形フィルタで分離した輝度信号および搬送色信号出力を用い、垂直相関性のないラインのときには、バンドパスフィルタで分離した輝度信号および搬送色信号出力を用いるようにした、いわば適応型のクシ形フィルタを提案している（例えば特開平３－７０３８３号公報等参照）。

【００１２】これによれば、搬送色信号について垂直相関性がない走査線においては、バンドパスフィルタにより分離した輝度信号および搬送色信号を出力信号とすることにより、ドット妨害の発生を回避できる。

【００１３】

【発明が解決しようとする課題】ところで、上述の適応型クシ形フィルタの場合、３水平走査線の間の映像信号の垂直相関性の監視を行う必要があるため、前記公報等に示されているように、複合カラー映像信号について１水平期間の遅延を行う遅延回路を２個用いて、現入力信号に対して１水平期間遅延した信号と、２水平期間遅延した信号とを生成し、現入力信号と１水平期間遅延した信号との間の垂直相関性、および、１水平期間遅延した信号と、２水平期間遅延した信号との間の垂直相関性をそれぞれ監視するようにしている。

【００１４】このように従来の適応型クシ形フィルタの構成においては、複合カラー映像信号を遅延する２個の１水平期間の遅延回路を必要とするために、比較的、回路規模が大きくなってしまうという問題があった。また、現入力信号と１水平期間遅延した信号との間の垂直相関性を監視する回路と、１水平期間遅延した信号と、２水平期間遅延した信号との間の垂直相関性を監視する回路とを、それぞれ別個に備える構成であるので、回路構成が複雑であった。

【００１５】この発明は、以上の点にかんがみ、従来に比べて回路規模が小さく、構成も簡単にすることができる適応型クシ形フィルタを提供することを目的とする。

【００１６】

【課題を解決するための手段】上記課題を解決するため、この発明によるクシ形フィルタは、輝度信号と搬送色信号とを含む複合カラー映像信号を受けて、この複合カラー映像信号を１水平期間遅延する第１の遅延回路と、前記複合カラー映像信号を受けて、この複合カラー映像信号から前記搬送色信号成分を抽出して出力するバンドパスフィルタと、前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との減算出力を得る第１の減算回路と、前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との減算出力を得る加算回路と、前記バンドパスフィルタの出力と、前記第１の減算回路の出力とを切り換えて出力する切換回路と、前記第１の減算回路の出力と、前記加算回路の出力とを受け、両出力の関係に基づいて、前記バンドパスフィルタの出力信号と前記第１の遅延回路の出力信号との相関の有無を示す２値信号を出力する相関検出回路と、前記

相関検出回路からの前記２値信号を１水平期間遅延する第２の遅延回路と、前記相関検出回路からの前記２値信号と、前記第２の遅延回路からの信号とを受け、両信号の演算結果から前記切換回路を切り換え制御する選択信号を出力する演算回路とを備え、前記切換回路から搬送色信号を得るようにしたことを特徴とする。

【００１７】上記の構成のこの発明によるクシ形フィルタにおいては、複合カラー映像信号からバンドパスフィルタにより搬送色信号の周波数帯域成分が抽出され、このバンドパスフィルタの出力信号が第１の遅延回路に供給されて、１水平期間遅延される。そして、この第１の遅延回路の入出力端の信号が第１の減算回路で減算されて、この第１の減算回路より搬送色信号が取り出される。

【００１８】そして、この第１の減算回路の出力信号が相関検出回路に供給されると共に、第１の遅延回路の入出力端の信号が加算回路に供給され、この加算回路の出力信号が相関検出回路に供給される。

【００１９】搬送色信号に垂直相関性があるときには、第１の減算回路の出力信号としては、当該搬送色信号が比較的大きなレベルで得られ、一方、加算回路の出力信号としては、２水平期間の搬送色信号が相殺された小レベルの出力が得られる。

【００２０】逆に、搬送色信号に垂直相関性がなく、例えば位相が逆相のときには、第１の減算回路の出力信号は小レベルとなり、一方、加算回路の出力信号は大きくなる。

【００２１】相関検出回路では、上記の第１の減算回路の出力と、加算回路の出力の上述の関係に基づいて２水平走査線間の搬送色信号の垂直相関性の有無が検出され、その検出出力の２値信号が出力される。

【００２２】この垂直相関性の有無の検出出力としての２値信号は、そのまま演算回路に供給されると共に、第２の遅延回路を通じて演算回路に供給される。演算回路は、この第２の遅延回路の入出力の２値信号から、３水平走査線間の垂直相関性の情報を得る。そして、この３水平走査線間の垂直相関性の有無の関係に基づいて、演算回路は、バンドパスフィルタの出力と、第１の減算回路の出力とを切り換えて出力する切換回路の切換制御を行う。

【００２３】上述のこの発明の場合には、搬送色信号帯域の信号の遅延用としては第１の遅延回路の１個を設けるだけでよい。そして、相関検出回路の出力を遅延する第２の遅延回路は、２値信号を遅延するだけでよいので簡単な構成のものを使用できる。また、相関検出回路は、第１の遅延回路の入出力の２水平走査線の信号分についての１つで済む。

【００２４】

【発明の実施の形態】以下、この発明によるクシ形フィルタを、カラーテレビジョン受像機に適用した場合の実施の形態について、図を参照して説明する。

【００２５】まず、この実施の形態のクシ形フィルタが適用されるカラーテレビジョン受像機の構成の概略を図３に示す。

【００２６】すなわち、テレビアンテナ２１にて受信されたテレビジョン放送信号は、チューナ２２に供給されて、ユーザの選局操作に応じたチャンネルの放送信号が映像中間周波信号に変換される。このチューナ２２からの映像中間周波信号は、映像中間周波増幅器２３を通じて映像検波器２４に供給されて、複合カラー映像信号が復調される。

【００２７】この例では、この複合カラー映像信号は、Ａ／Ｄ変換器２５によりデジタル信号に変換された後、後述するこの実施の形態のクシ形フィルタが適用される適応型クシ形フィルタ１００に供給されて、デジタル信号の状態の輝度信号ＤＹと搬送色信号ＤＣとに分離される。このクシ形フィルタ１００のデジタル出力ＤＹおよびＤＣは、それぞれＤ／Ａ変換器２６Ｙおよび２６Ｃに供給されて、アナログ信号の輝度信号Ｙおよび搬送色信号Ｃとに戻される。

【００２８】そして、輝度信号Ｙは、そのままマトリクス回路２８に供給される。また、搬送色信号Ｃはクロマデコーダ２７に供給されて、色差信号Ｒ－ＹおよびＢ－Ｙがデコードされる。そして、これら色差信号Ｒ－Ｙ，Ｂ－Ｙがマトリクス回路２８に供給される。

【００２９】マトリクス回路２８は、これに入力される輝度信号Ｙと、色差信号Ｒ－Ｙ，Ｂ－Ｙから３原色信号Ｒ，Ｇ，Ｂを生成し、これらの信号Ｒ，Ｇ，Ｂをカラー陰極線管２９に供給し、その画面に画像を再生するようにする。

【００３０】次に、この実施の形態のクシ形フィルタについて、図１および図２を参照して説明する。図１は、この実施の形態のクシ形フィルタの回路構成を示すものであり、図２は、このクシ形フィルタの回路動作を説明するためのタイムチャートである。

【００３１】前述したように、Ａ／Ｄ変換器２５において複合カラー映像信号はデジタル化されるが、この例の場合、複合カラー映像信号は、サンプリング周波数が例えば４ｆｓ（ｆｓは色副搬送波周波数で、ＮＴＳＣ方式の場合には、約３．５８ＭＨｚ）で、８ビット／１サンプルのデジタル信号とされる。このデジタル複合カラー映像信号は、バンドパスフィルタ１０１に供給され、これにて搬送色信号の周波数帯域の成分が抽出される。

【００３２】バンドパスフィルタ１０１の出力は、第１の遅延回路１０２に供給されて、１水平期間遅延される。この遅延回路１０２は、この例では、デジタル映像信号は、１水平期間当たり約９１０サンプルとなり、デジタル映像信号は８ビット／サンプルであるので、周波数４ｆｓのクロックで９１０段分順次に転送するシフトレジスタの８個分で構成することができる。

【００３３】そして、バンドパスフィルタ１０１の出力と、第１の遅延回路１０２の出力とは、それぞれ第１の減算回路１０３および加算回路１０４に供給される。バンドパスフィルタ１０１の出力は搬送色信号帯域成分であるので、第１の減算回路１０３の出力ｙのレベルと加算回路１０４の出力ｘのレベルとは、バンドパスフィルタ１０１の出力と第１の遅延回路１０２の出力との間の垂直相関性に応じたものになる。

【００３４】もちろん、バンドパスフィルタ１０１の出力と、第１の遅延回路１０２の出力との間に垂直相関性があるときには、第１の減算回路１０４の出力としては搬送色信号出力が良好に得られている。この第１の減算回路１０４の出力は、遅延回路１０６を通じて、出力する搬送色信号ＤＣを取り出すための切換スイッチ回路１０７の入力端Ｂ側に供給される。遅延回路１０６は、切換スイッチ回路１０７の入力端Ａ側に入力される信号とのタイミング合わせのためのもので、第１の減算回路１０３での遅延分と、後述するバンドパスフィルタ１０５での遅延分との和の遅延量を有する。

【００３５】そして、切換スイッチ回路１０７の入力端Ａには、バンドパスフィルタ１０１の出力が、さらにバンドパスフィルタ１０５によって帯域制限された搬送色信号帯域の信号が供給される。バンドパスフィルタ１０５は、バンドパスフィルタ１０１の出力から、さらに輝度信号成分を除去するために帯域制限するもので、これは省略することもできる。

【００３６】切換スイッチ回路１０７は、以下のようにして垂直相関性の有無に基づいて生成される切換選択信号ＳＥＬにより切り換えられる。

【００３７】すなわち、加算回路１０４の出力ｘおよび第１の減算回路１０３の出力ｙは、それぞれ絶対値化回路１１１および１１３に供給されて、それぞれの絶対値が求められる。絶対値化回路１１１および１１３の出力は、それぞれローパスフィルタ１１２および１１４に供給され、これらから、なだらかに変化する信号｜ｘ｜および｜ｙ｜がそれぞれ得られる。

【００３８】そして、これらローパスフィルタ１１２および１１４からの信号｜ｘ｜および｜ｙ｜は相関演算部１１５に供給される。この相関演算部１１５では、図４の表１に示す評価式による評価演算を実行し、その評価出力として２値信号、すなわち、１ビットの評価信号ｋ０を出力する。

【００３９】この場合、バンドパスフィルタ１０１の出力と第１の遅延回路１０２の出力との間の垂直相関性が高ければ減算回路１０３の出力ｙの出力は、加算回路１０４の出力ｘに比較して大きくなる。逆に、バンドパスフィルタ１０１の出力と第１の遅延回路１０２の出力との間の垂直相関性が低ければ、加算回路１０４の出力ｘは、減算回路１０３の出力ｙに比較して大きくなる。図４の評価式における整数「Ｎ」の値は、垂直相関の有無を判別する基準を定めるためのもので、この例では、例えばＮ＝４とされる。

【００４０】つまり、この例では、｜ｙ｜／４≧｜ｘ｜を満足する程度に、減算回路１０３の出力レベルが加算回路１０４の出力レベルに比較して大きければ、垂直相関性があると評価して、評価信号ｋ０は「１」とする。また、｜ｙ｜／４＜｜ｘ｜を満足する程度に、減算回路１０３の出力レベルが加算回路１０４の出力レベルに比較して小さければ、垂直相関性がないと評価して、評価信号ｋ０は「０」とする。

【００４１】この相関検出部１１５の出力である評価信号ｋ０は、そのまま演算部１１７に供給される。また、相関検出部１１５からの評価信号ｋ０は、第２の遅延回路１１６を通じて１水平期間遅延した信号ｋ１として演算部１１７に供給される。この例の場合、この第２の遅延回路１１６は、１ビットの評価信号ｋ０を１水平期間だけ遅延するものでよく、周波数が４ｆｓのクロックで駆動される９１０段のシフトレジスタの１個で構成可能である。

【００４２】この場合、評価信号ｋ０は、現在入力中の走査線と１水平期間前の走査線との間での搬送色信号の垂直相関性の有無を示すものであり、信号ｋ１は、１水平期間前の走査線と２水平期間前の走査線との間での搬送色信号の垂直相関性の有無を示すものである。すなわち、評価信号ｋ０およびｋ１により、３水平走査線間の垂直相関性が分かる。

【００４３】演算部１１７は、これら評価信号ｋ０およびｋ１を受けて、図５の表２の真理値表に示すような演算結果を得ることができる演算を実行し、その演算結果として、前述したスイッチ回路１０７の切換選択信号ＳＥＬを生成する。図６の表３は、この切換選択信号ＳＥＬと切換スイッチ回路１０７の切換状態との関係を示すものである。すなわち、信号ＳＥＬが「１」のときには、切換スイッチ回路１０７は、バンドパスフィルタ１０５の出力を選択するように入力端Ａ側に切り換えられ、信号ＳＥＬが「０」のときには、切換スイッチ回路１０７は、第１の減算回路１０３の出力を選択するように入力端Ｂ側に切り換えられる。

【００４４】したがって、表２の真理値表に従うと、現在入力中の走査線と１水平期間前の走査線との間での搬送色信号の垂直相関性がなく、しかも、１水平期間前の走査線と２水平期間前の走査線との間での搬送色信号の垂直相関性がある場合には、切換スイッチ回路１０７はバンドパスフィルタ１０５の出力を選択し、その他のときには、第１の減算回路１０３の出力を選択する。

【００４５】この切換スイッチ回路１０７での適応的な切り換え動作について、図２を参照してさらに説明する。

【００４６】図２（Ａ）は、バンドパスフィルタ１０１の出力ａにおける各水平区間での搬送色信号の位相を示

している。図２では５水平区間分について示しており、搬送色信号について垂直相関性が存在しているときには、１水平期間ごとに位相が反転するが、この図２の例では、左から２番目の水平区間と３番目の水平区間との間では、搬送色信号の位相が反転しており、垂直相関性がない状態となっている。

【００４７】このとき、第１の遅延回路１０２の出力ｂにおける各水平区間の状態は、図２（Ｂ）の状態になる。また、それよりも、さらに１水平期間（図では１Ｈと記載）遅延されている状態を図２（Ｃ）に示す。

【００４８】加算回路１０４では出力ａと出力ｂとの加算を行うので、その出力ｘは、図２（Ｄ）に示すようになり、出力ａが１水平期間前の信号と相関がないときに、大きなレベルの信号となる。また、第１の減算回路１０３では出力ａと出力ｂとの減算を行うので、その出力ｙは、図２（Ｅ）に示すようになり、出力ａが１水平期間前の信号と相関がないときに、小さなレベルの信号となる。

【００４９】したがって、相関検出部１１５で、前述した図４の評価式の演算を行った結果としての評価信号ｋ０，ｋ１は、図２（Ｆ）に示すようなものとなる。そして、演算部１１７での図５の真理値表に従う演算の結果の出力ＳＥＬも、図２（Ｆ）に示すものとなる。

【００５０】この結果、出力ａが１水平期間前の信号と相関がないときに、出力ｙを切換スイッチ回路１０７から選択すると、図２のように適切な搬送色信号が得られなくなるのに対して、この実施の形態によれば、バンドパスフィルタ１０５の出力を切換スイッチ回路１０７が選択するようになるので、図２（Ｇ）に示すように、常に適切な搬送色信号出力が得られるようになる。

【００５１】なお、図５の真理値表に示すように、この例では、現在入力中の走査線と１水平期間前の走査線との間での搬送色信号の垂直相関性がないときであっても、１水平期間前の走査線と２水平期間前の走査線との間での搬送色信号の垂直相関性もないときには、バンドパスフィルタ１０５の出力を選択せずに、第１の減算回路１０３の出力を選択する。これは、斜め解像度を劣化させないようにするためである。

【００５２】すなわち、画面の図柄に斜め線が含まれている部分では、現在入力中の走査線と１水平期間前の走査線との間、および、１水平期間前の走査線と２水平期間前の走査線との間での搬送色信号の垂直相関性は、共にない状態になる。このときバンドパスフィルタ１０５の出力を搬送色信号出力として選択すると、輝度信号の３．５８ＭＨｚ近傍成分が当該搬送色信号出力に含まれ、クロスカラー（明暗の縞）を生じてしまう。これに対して第１の減算回路１０３の出力では輝度信号成分は除去されている。そこで、この例では、このように３水平走査線間で垂直相関がないと判断されるときには、クロスカラーを防止することができるように第１の減算回路１０３の出力を搬送色信号出力として選択するものである。

【００５３】こうして切換スイッチ回路１０７から得られるデジタル搬送色信号ＳＣは、第２の減算回路１０９に供給される。また、Ａ／Ｄ変換器２５からのデジタル複合カラー映像信号が、第２の遅延回路１０８を通じて、この第２の減算回路１０９に供給される。第２の遅延回路１０８は、切換スイッチ回路１０７からの搬送色信号ＳＣの出力タイミングとのタイミング合わせをするためのもので、バンドパスフィルタ１０１と、第１の減算回路１０３と、遅延回路１０６の分の遅延量を有する。

【００５４】第２の減算回路１０９では、デジタル複合カラー映像信号からデジタル搬送色信号ＳＣが減算されて、これよりデジタル輝度信号ＳＹが得られる。

【００５５】この第２の減算回路１０９からのデジタル輝度信号ＳＹは、水平周波数特性補正回路１２０Ｙにより水平周波数特性が補正された後に、Ｄ／Ａ変換器２６Ｙに供給され、アナログ輝度信号Ｙに戻される。

【００５６】また、切換スイッチ回路１０７からのデジタル搬送色信号ＳＣは、水平周波数特性補正回路１２０Ｃにより水平周波数特性が補正された後に、Ｄ／Ａ変換器２６Ｃに供給され、アナログ搬送色信号Ｃに戻される。

【００５７】以上説明したようにして、この実施の形態のクシ形フィルタによれば、３水平走査線間の垂直相関性に応じて適応的に搬送色信号出力を得ることができる。そして、この実施の形態のクシ形フィルタにおいては、１水平期間の遅延回路は、８ビットの搬送色信号帯域の信号の遅延回路１０２と、１ビットの評価信号ｋ０の遅延回路１１６でよく、合計で９ビットの信号分の１水平期間の遅延回路を設けるだけでよくなる。このため、従来のように、８ビットの信号の遅延回路を２個設ける場合に比べて、回路規模を小さくすることができる。

【００５８】また、垂直相関性の有無を検出する回路部分は、遅延回路１０２の入出力についてのみ設けるだけでよく、従来のように、現在入力中の走査線と１水平期間前の走査線との間での搬送色信号の垂直相関性についての相関検出部と、１水平期間前の走査線と２水平期間前の走査線との間での搬送色信号の垂直相関性について相関検出部とを設ける場合に比べて、構成を簡単にできると共に、回路規模の縮小になる。

【００５９】以上は、この発明によるクシ形フィルタをテレビジョン受像機に適用した場合について説明したが、この発明は、その他の映像機器にも適用できる。図７は、この発明によるクシ形フィルタが適用されたＶＴＲの構成を示すものである。

【００６０】すなわち、映像入力端子３１を通じて入力された複合カラー映像信号は、Ａ／Ｄ変換器３２にてデ

ジタル複合カラー映像信号に変換された後、前述した図１の構成のクシ形フィルタ１００により構成される適応型クシ形フィルタ３３に供給されて、前述のようにしてデジタル輝度信号ＤＹおよびデジタル搬送色信号ＤＣが分離され出力される。

【００６１】この適応型クシ形フィルタ３３よりのデジタル輝度信号ＤＹおよびデジタル搬送色信号ＤＣは、それぞれＤ／Ａ変換器３４Ｙおよび３４Ｃによりアナログ輝度信号およびアナログ搬送色信号Ｃに戻される。そして、これら輝度信号および搬送色信号は記録処理回路３５に供給され、輝度信号はＦＭ変調され、搬送色信号は、このＦＭ変調された輝度信号の低域側に周波数多重される。そして、この周波数多重信号が回転ヘッド３６に供給されて、磁気テープに記録される。

【００６２】なお、上述の実施の形態においては、クシ形フィルタは、デジタル回路であって、Ａ／Ｄ変換器およびＤ／Ａ変換器を外付けのものとしたが、Ａ／Ｄ変換器およびＤ／Ａ変換器をも備える構成とすることも勿論できる。

【００６３】また、クシ形フィルタは、デジタル回路の構成ではなく、アナログ回路の構成とすることもできることは言うまでもない。

【００６４】

【発明の効果】以上説明したように、この発明によれば、３水平走査線間の垂直相関性に応じて適応的に搬送色信号出力を得るクシ形フィルタを、小さい回路規模＊で、かつ、構成な回路構成により実現することができる。

【図面の簡単な説明】

【図１】この発明によるクシ形フィルタの一実施の形態の回路図である。

【図２】図１の実施の形態を説明するためのタイムチャートを示す図である。

【図３】この発明によるクシ形フィルタを用いるカラーテレビジョン受像機の一例の構成を示すブロック図である。

【図４】図１の実施の形態の説明に用いる図である。

【図５】図１の実施の形態の説明に用いる図である。

【図６】図１の実施の形態の説明に用いる図である。

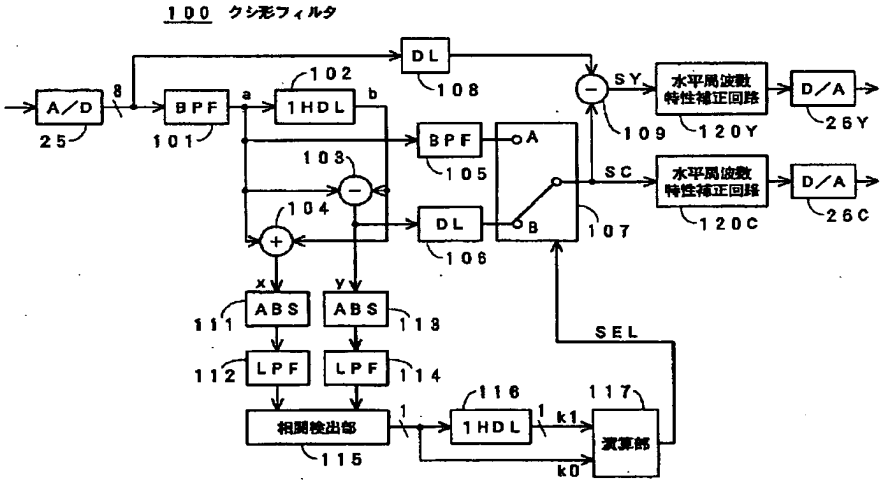
【図７】この発明によるクシ形フィルタを用いるＶＴＲの一例の構成を示すブロック図である。

【図８】クシ形フィルタの基本構成を説明する図である。

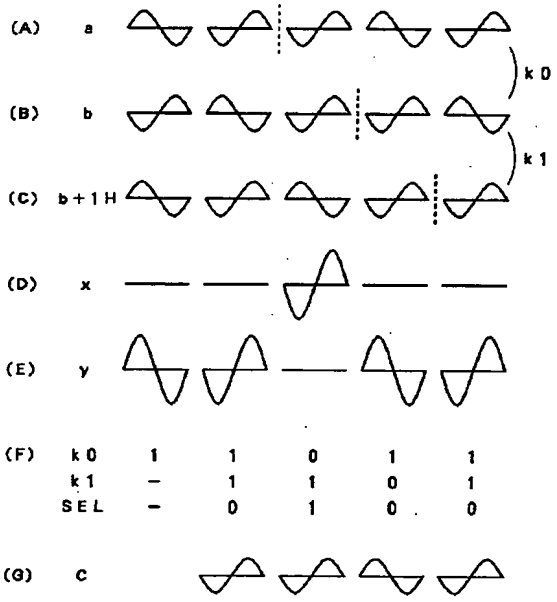
【符号の説明】

２５…Ａ／Ｄ変換器、２６Ｙ，２６Ｃ…Ｄ／Ａ変換器、１０１，１０５…搬送色信号帯域を抽出するバンドパスフィルタ、１０２…映像信号の１水平期間の遅延回路、１０３…第１の減算回路、１０４…加算回路、１０７…切換スイッチ回路、１０９…第２の減算回路、１１５…相関検出部、１１６…２値信号の１水平期間の遅延回路、１１７…演算部

【図１】



【図２】



【図４】

［表１：相関検出部評価式］

評価式	k0
|y|/N ≧ |x| (N:整数)	1
|y|/N < |x| (N:整数)	0

【図５】

［表２：演算部真理値表］

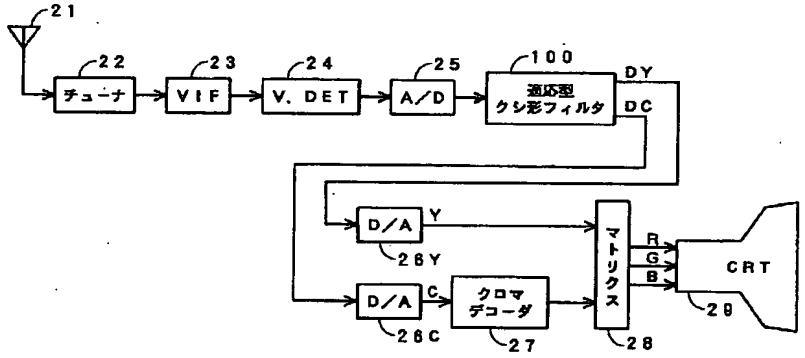
k0	k1	SEL
0	0	0
0	1	1
1	0	0
1	1	0

【図６】

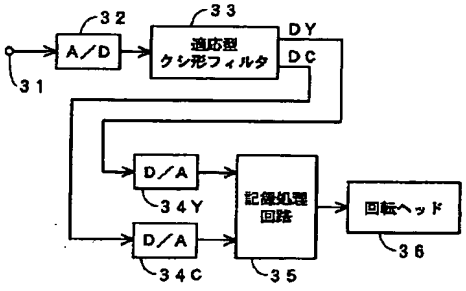
［表３：信号ＳＥＬと出力信号ＳＣとの関係］

SEL	SC
1	A
0	B

【図３】



【図７】



【図８】